New London Instrument Company

NEW LONDON, CONNECTICUT

INSTRUCTIONS
for
INSTALLATION AND OPERATION
of
MODEL 191
NOISE DIODE
NOISE SOURCE

Manufactured by
NEW LONDON INSTRUMENT COMPANY
New London, Connecticut

I. GENERAL DESCRIPTION

1. The Model 191 Noise Source is a calibrated random noise generator, providing output over a wide frequency (100-3000 Mc) and power range. It may be used for the measurement of noise figure, receiver gain, and for the indirect calibration of standard signal sources.

II. SPECIFICATIONS

1. Electrical

Power Supply Requirements

117 volts ± 10%

50-60 cycles

130 Watts

Output Frequency Range

100-3000 Mc

Output Impedance

50 ohms unbalanced, into Type N Connector

Noise Figure Range

0-20 db

Meter Calibration

Linear in db noise figure, logarithmic in DCMA

Tube Complement

1 5U4, 2 6AS7, 1 6C4, 1 6SJ7, 1 Bendix TT-1 diode,

1 6X4, 2 VR-105

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2. Mechanical

Overall dimensions

16" long x 10" wide x 10" deep

Weight

45 pounds

III CIRCUIT DESCRIPTION

1. General

This Noise Source employs a coaxial type noise diode with a tungsten filament as a temperature-limited fluctuation noise generator. The plate voltage is sufficiently high to insure temperature-limited operation at all plate currents. The diode filament is supplied with high frequency current from the output of a regulated audio oscillator. The diode plate current which is proportional to noise power output is adjusted by the LEVEL control on the front panel. This current is indicated by a front panel meter linearly calibrated in db noise figure. An OUTPUT CUT-OFF control is included for use in obtaining readings proportional to the noise power output of the circuit under test. An automatic cut-off is incorporated to limit operation at high currents in order to prolong the life of the noise diode. After cut-off the instrument may be returned to operating condition by pressing the OPERATE control on the front panel.

2. RF Section

The RF section is a separate unit, of special design. The Type TT-1 tube (V-9) is of a coaxial type, designed to match the

impedance of a 50 ohm line. The output of this tube is lead to the front panel through a 50 ohm Type N connector (J-1). The plate element of the tube is cylindrical in shape, and forms the outside wall. Plate current is applied to the tube through the casting, to which is attached a solder lug terminal. In order to prevent B+ from shorting to ground, the ring-shaped casting is separated by two capacitors. A capacitor is also provided at the connector end to prevent B+ from reaching the front panel. The two capacitors on the ring-casting also prevent short-circuiting of the audio section. The filament of V-9 is connected to a loop of approximately nine turns of fine wire inside a copper ring. This ring is supported in turn inside the casting. The copper ring is terminated to ground through a 50 ohm resistor, R21. The impedance of the copper ring and the casting is 100 ohms. Because there are two paths to ground, each of 100 ohms impedance, the effective impedance to the tube is 50 ohms. Coil L-2 forms a primary, and the nine turns of wire the secondary, of a transformer that supplies the filament of V-9 from audio oscillator V-5. This high frequency filament supply avoids hum modulation of noise power.

3. Output Level Control Circuit and Timing Circuit

Noise output is turned on by actuating Switch S-3 which grounds the coil of Relay RY1. This relay has its own holding, or latching circuit, of which Relay RY-2 is a part. The ground of the coil of RY2 is connected to the plate of V-3. This tube, operated as a diode, receives as its filament supply, a part of the power being

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used to heat the filament of V-9. As the filament of V-3 heats up and the tube begins to conduct, the coil of RY2 is energized, disconnecting the output circuit. The time of this cutoff is varied in two ways; one, as the level control is advanced, a greater amount of current flows to the filament, and the tube conducts in a shorter period of time, and two, by varying the setting of the Time Set Control located at the rear of the cabinet.

IV INSTALLATION AND OPERATION

1. Installation

The unit has been thoroughly checked and tested before shipment, and is delivered to the customer complete with tubes, and ready for operation. After unpacking and before placing in operation, visually check the damage received in transit.

ON-OFF Switch is located in the lower left hand corner of the panel. A 2 amp. fuse is located at the rear of the cabinet for supply circuit protection.

2. Controls

Power Switch

Controls all power to the Model 191.

Output Cutoff

Is used in obtaining readings proportional to the noise power output to the circuit under test.

Diode Filament Pilot Light

Indicates application of power to the diode filament.

Operating Push Button

Is used to return the instrument to operating condition after the automatic cutoff has operated.

Level Control

Regulates the diode plate current which is proportional to noise power output.

Meter

Indicates the diode plate current in proportion to noise power output, and is calibrated in db noise figure. This meter also has a scale for transient time correction.

Output Connector

A Type N connector, 50 ohms, used for connecting to the equipment under test.

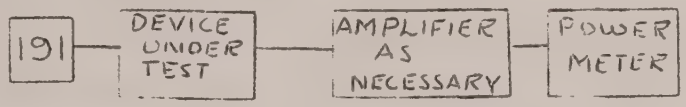
3. Operation

Preliminary checks

Connect line plug to 117 V, 10%, 60 cycle AC. Turn power switch on which should light up the LINE pilot light. Push the OPERATING push button. The DIODE FILAMENT pilot light should light up. Advance the level control (clockwise). The needle on the meter should follow. If too much lag is noticed, adjust FILAMENT SET rheostat on rear of cabinet. Adjust the LEVEL control for reading of 100 Ma. The diode filament should remain lighted for about thirty seconds when starting with a cold unit. If the diode filament remains lighted for a longer time, ADJUST the TIME SET control at the rear of the unit. This timing control is a feature which acts to prolong the life of the noise diode tube.

Connections and Operation

To connect the Noise Diode to equipment to be tested, use a short piece of 50 ohm transmission line with a Type N connector, such as the UG-18B/U, on one end. The Noise Diode may be connected as shown below:



With the setup shown above, turn Noise Source on. Read the ambient noise as shown by the Power Meter. Advance the level control until the figure is doubled. The noise figure of the unit under test is then read directly from the Noise Source meter scale. The Output Cutoff switch may be used to check original power meter readings.

Tests may be made using a 3 db pad as shown below:

With the LEVEL control of the Noise Diode in the Counterclockwise position, the indicating meter will read ambient noise power level of the overall system. The 3 db pad is then switched in, which effectively halts the power reaching the indicating meter and the LEVEL control of the Noise Source is adjusted so that the indicating meter reads exactly the same value as it did originally. The receiver noise figure is then read directly from the meter on the noise source. In both methods transit time corrections may be made from the scale on the face of the meter. For very accurate

readings, the Smith chart included with the unit may be used for making impedance corrections.

V MAINTENANCE

Chassis & Front Panel Removal

The front panel and chassis can be removed by unscrewing four Phillips head screws on the front panel, two slotted screws on the rear of the cabinet, and four slotted screws on the botton.

Tube Replacement

With the exception of the Type TT-1 tube, standard stock items may be used. The manufacturer does not recommend replacement of the Type TT-1 by the user. The entire RF assembly should be returned to the manufacturer for tube replacement.

Charts and Illustrations

Resistance and voltage charts, parts list, and overall schematic are included to facilitate trouble shooting.

Tube life

A catalog sheet for the type TT-1 tube is included. This shows expected tube life under various conditions.

TUBE (SOCKET) VOLTAGES MEASURED TO GROUND WITH H.P. VTVM MODEL 410B

Level control set to minimum

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1									
V1		169 AC		422 AC		422 AC		170 AC	
V2	24	342	6.2AC	25	340	6.2 AC		7.1 AC	
V3			6.4AC	6.2 AC	340	340	6.4AC		
V4		7.2	5.4AC	6.2AC	5.4AC	1.2 AC		25	
V5	62	150	4.9	58	150	4.9	6.8AC	62	
V6	-300		420AC	420 AC		130	420AC		
V7		215			108				
V8		108		215					

RESISTANCE MEASUREMENTS

Socket Pins to Ground, Power Off

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1		50K		400		370		50K	
V2	1 meg	50K	62K	1 meg	50 K	62K	0	0	
V3			64K	64K	60 K	60K	64K		
V4		0	∞	350K		13K	0	1 meg	
V5	42K	∞	470	40K		470	0	0	
V6	5 meg		40	40		5 meg	40		
V7		4.6 meg			∞				
V8	∞		4.6		0				

REPLACEMENT PARTS

Circuit Ref	Description	Mfr.	Part No.
R1	Resistor, W.W. 25 K, 25 Watt	Resistor, Inc.	Type 2B
R2	Resistor, W.W., 8200 ohms, 2 W	IRC	BW-2
R4	Resistor, Comp. 1 Meg 1/2 W ±10%		
R5, R6	Resistor, Comp, 470 ohm ½ W ±10%		
R7	Resistor, Comp, 3300 ohms ½ W ±10%		
R8	Resistor, Comp, 1K ±10%, ½W		
R9	Resistor, Comp, 33 Meg ±10%, ½W		
R12	Resistor, Variable 100K ohms, 2W	Allen-Bradley	
R13	Resistor, Comp, 10K ±10%, ½W		
R16, R17	Resistor, Comp, 47K ±10%, 1W		
R18	Resistor, Comp, 47 ohms ±10%, 1W		
R19 R20	Resistor, Comp, 68K ±10%, 1W		
R21	Resistor, Deposited Carbon 49.5 ohms ±1% ½W	Wilcor, Prod.	CPS½
R25, R26	Resistor, Comp, 4.7K ±10% ½W		
R23	Resistor, Variable 200 ohms, 2W	Allen-Bradley	
R24	Resistor, Variable, 50K, 2W	Allen-Bradley	
C7, C8	Capacitor, Mica, .01MFD ±10%, 500V	El Memco	CM30A103K
C2	Capacitor, Paper, 10MFD, 600V	Cornell-Dubilier	CP70E1F106V
C3	Capacitor, Paper, 4MFD, 600V	Micamold	353-104
C6	Capacitor, Paper, 1MFD, 400V	GE	23F-132
C5	Capacitor, Mica, 1000MMF ±10% 500V	El Menco	CM30A102K
C9	Capacitor, Mica,5000 MMF ±10%, 500V	El Menco	CM30A502K
C10	Capacitor, Mica, 100 MMF ±10%, 500V	El Menco	CM20A101K

C11, C12	Capacitor, Button, 500MMF, 500V	Star Elect. Dist. Co.	A203Type A
S1	Switch, Rotary, 3 Amp, 125V	Chicago Tel	Type GC
S2	Switch, Pushbutton, N. C.	Acro	3NC55P
S3	Switch, Push Button, N. O.	Acro	3NO55P
V1	Electron Tube 5U4	GE	
V2, V5	Electron Tube, 6AS7		
V3	Electron Tube, 6C4		
V4	Electron Tube, 6SJ7		
V6	Electron Tube, 6X4		
V7, V8	Electron Tube OC3		
V9	Electron Tube, TT-1	Bendix	
J1	Output Connector	NLI	PC-5
XF1, XF2	Fuse holder	Alden	440FH
X11, X12	Pilot Light Assembly	Drake	50
I1, I2	Lamp, Pilot	GE	44
F1	Fuse, 2 amp, 3AG		
F2	Fuse 1/4 amp, 3AG		
	Knob	NLI	HK10
M1	Meter	NLI	
	Rubber Feet	Lavelle	757-R
	Handle	Weber-Knapp	5702
RY1	Relay TPDT	Phil-Trol	27QA
RY2	Relay SPDT	Sigma	5F
Li	Choke 10HY	Megeff	
T1	Power Transformer	NLI q	TP-11-B
	RF Assembly	NLI	91-RFA1

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WARRANTY

The New London Instrument Company warrants each of its instruments to be free from defects in materials and workmanship. Our responsibility is limited to adjusting instruments and repairing or replacing defective parts (except tubes, fuses, batteries) for a period of one year after shipment when, in our opinion, such work is covered by this warranty. Warranty on tubes, fuses, and batteries depends on the warranty of the original manufacturer. The New London Instrument Company shall under no circumstances be liable for loss of profit or other damages.

SPECIFICATION CHANGES

The New London Instrument Company retains the right to discontinue any instrument without notice and to change specifications without responsibility for incorporating changes in instruments already sold.

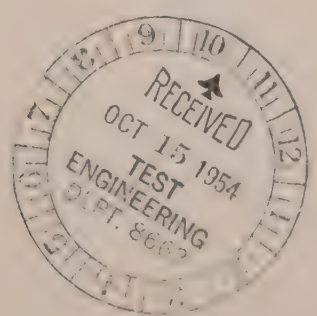
REPAIRS

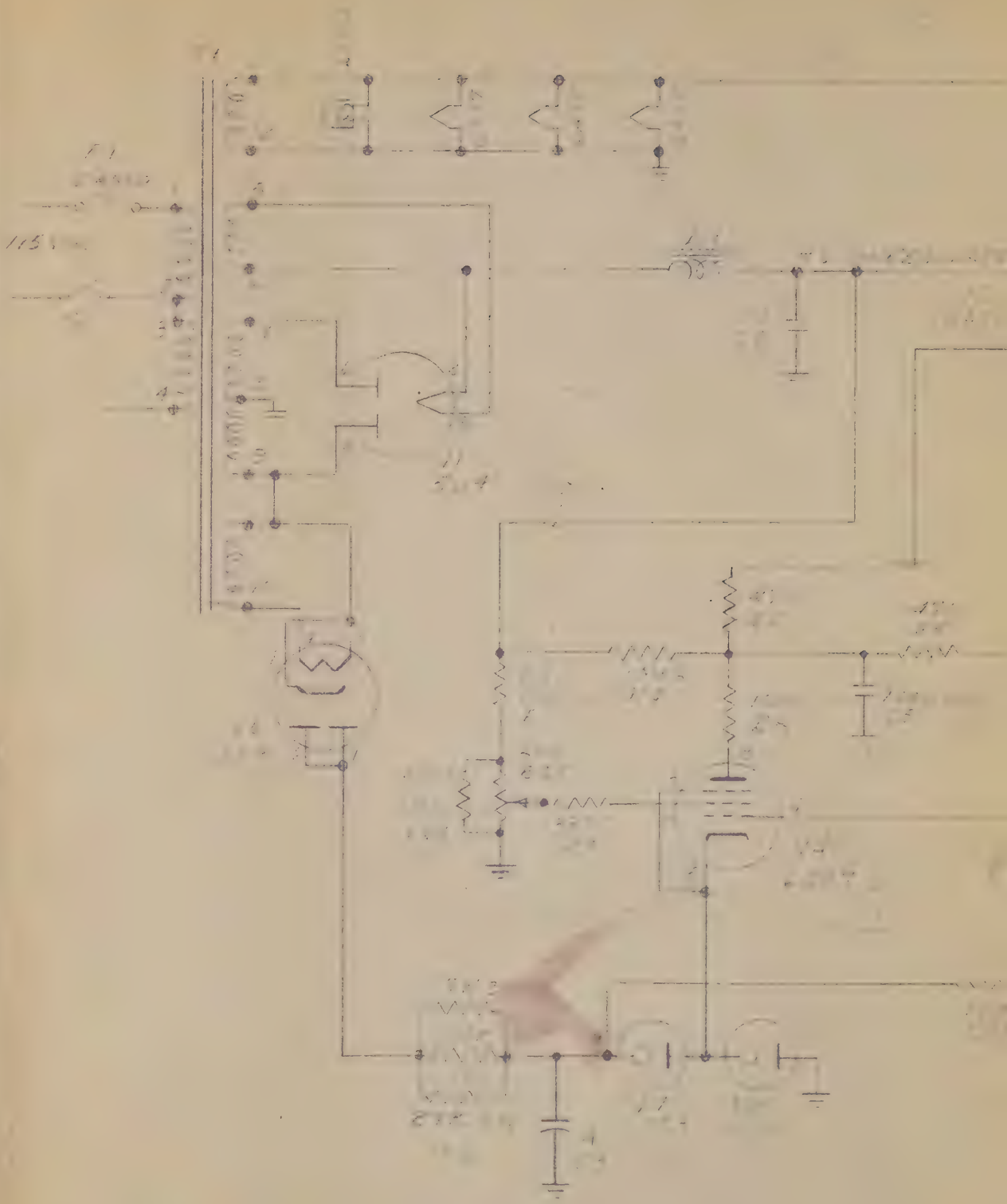
The New London Instrument Company maintains stocks of repair and replacement parts. If the customer wishes to return an instrument for repairs, permission should be obtained from our factory or one of our accredited representatives.

In returning an instrument, the customer should state the difficulties experienced. Reference to specific parts, especially by circuit diagram designation, is always helpful.

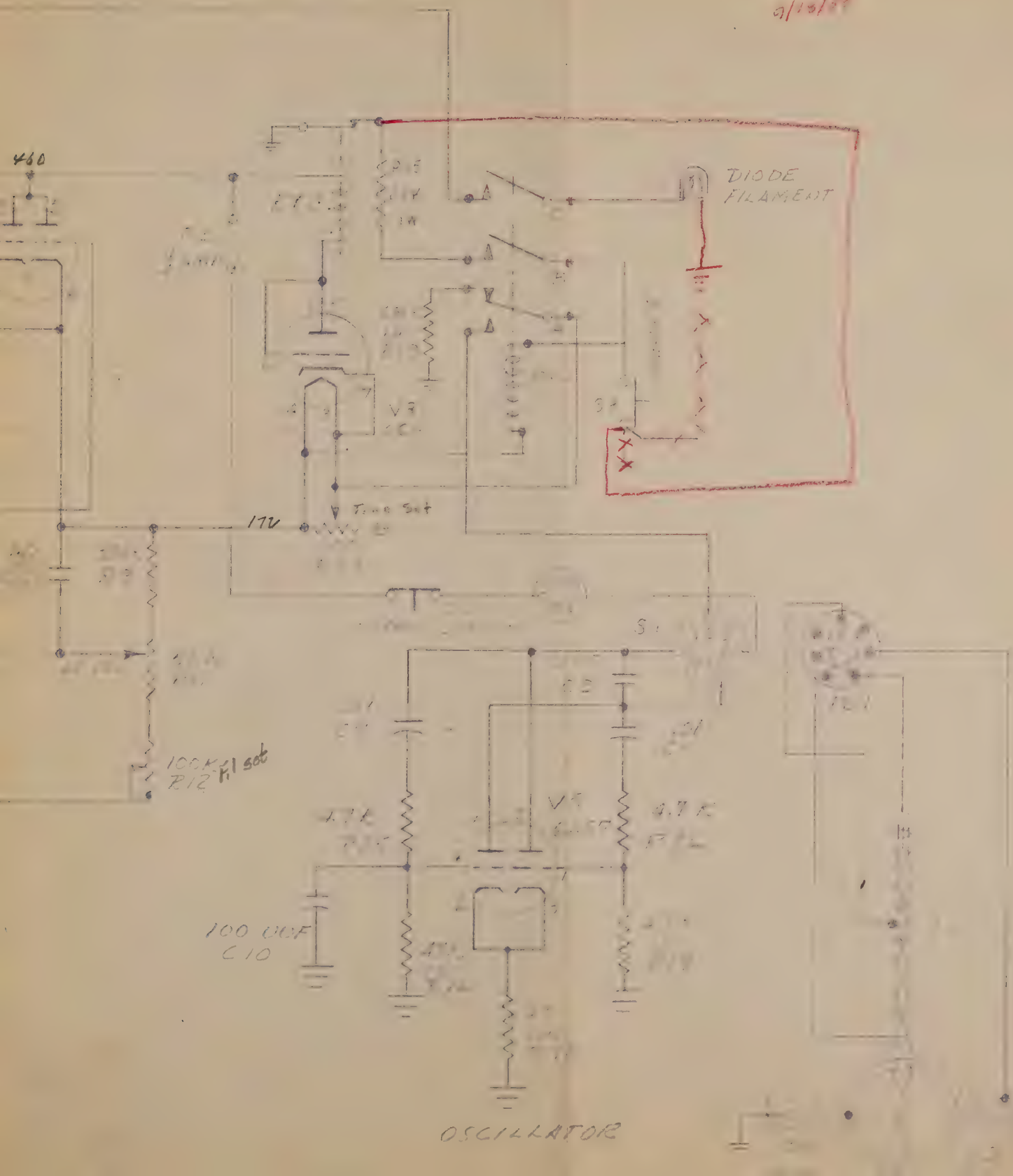
NEW LONDON INSTRUMENT
COMPANY

New London, Connecticut





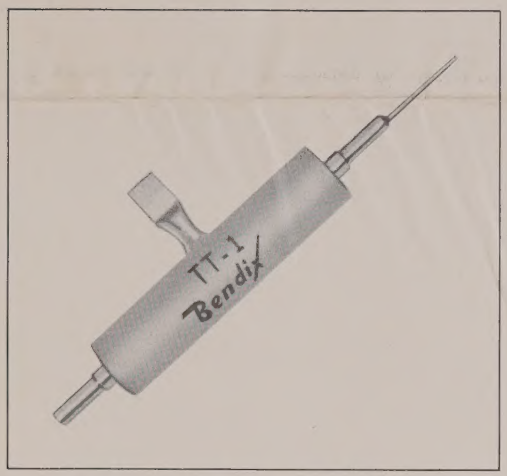
MOD. TO PREVENT RECYCLE UNTIL TIMMER RELEASED.
PRM
9/16/57



RTMA 6144

Red Bank Type TT-1

NOISE DIODE



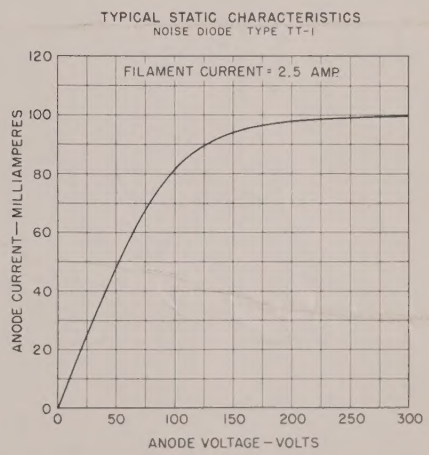
DESCRIPTION

This tube is designed for use as a noise source in HF and UHF measurements. It is constructed to match the characteristic impedance of a 50-ohm coaxial line. The noise output is a direct function of anode current and is controlled by varying the applied filament voltage. The coaxial construction gives wide band operation thus permitting use with any type of circuit — tuned or untuned. Correct matching of impedances and a termination is required to keep the VSWR of the overall circuit to a minimum.

RATINGS

Anode voltage	300 volts D-C (max.)
Anode current	100 ma. D-C (max.)
Filament voltage	3.2 volts A-C or D-C
Filament current	2.5 amp.
Anode dissipation	30 watts (max.)
Characteristic coaxial impedance	50 ohms
Frequency range	3000 megacycles (max.)
Dynamic impedance	16,000 ohms (min.)

TYPICAL STATIC CHARACTERISTICS



OPERATING CHARACTERISTICS

Since the tube operates under temperature limited emission conditions, anode current is controlled by holding the anode voltage constant and varying the filament supply voltage or current. Maximum operating conditions with an anode dissipation of 30 watts will require supplementary cooling of the anode. This can be accomplished by heat conduction through the radio frequency plumbing, by air jet or by thermal conduction through a mounting block. Anode dissipation should be limited to 18 watts unless cooling means are provided. Maximum anode hot spot temperature should not exceed 400°F.

Bendix AVIATION CORPORATION
RED BANK DIVISION
BENDIX AVIATION CORPORATION
EATONTOWN, NEW JERSEY
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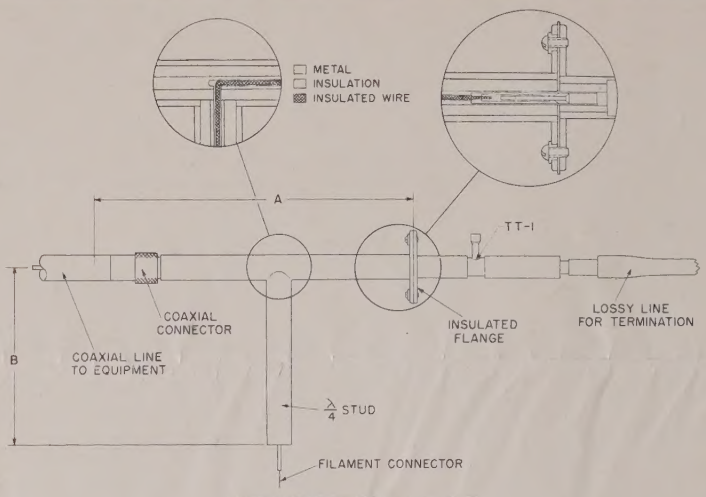
NOISE DIODE

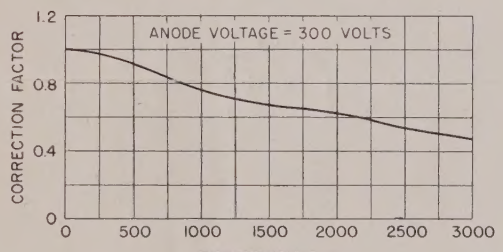
RTMA 6144
Red Bank Type TT-1



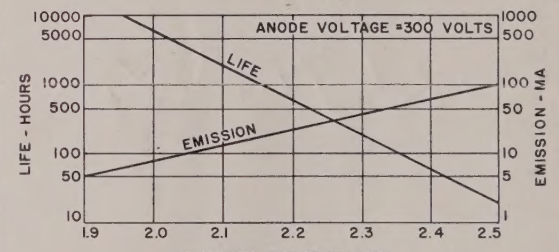
FREQUENCY	A	B
2000 MEGACYCLES	2.401	1.725
750 MEGACYCLES	3.178	3.632

"A" AND "B" DIMENSIONS VARY WITH THE CENTER FREQUENCY OF EQUIPMENT UNDER TEST.

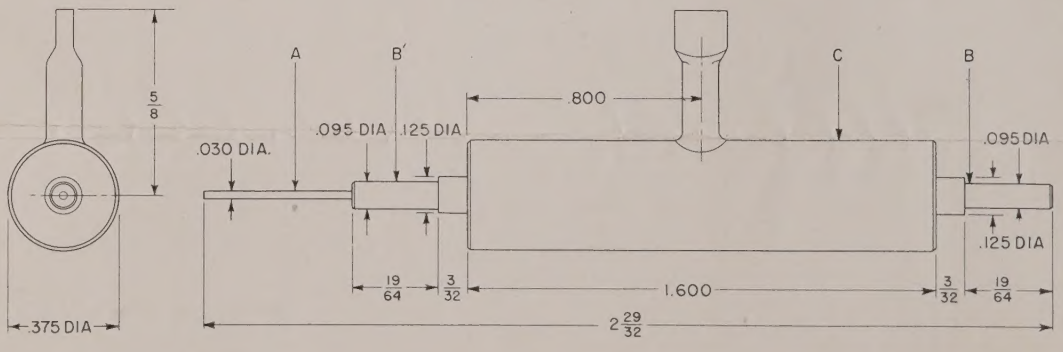
TUBE MOUNT



CALCULATED TRANSIT TIME REDUCTION OF NOISE



CALCULATED MINIMUM LIFE EXPECTANCY AND EMISSION CURVES



FILAMENT PAIR	A-B' OR A-B
ANODE	C
ANODE RETURN	B OR B'
50 OHM COAX.	B, B'-C

OUTLINE DRAWING